OPERATING AND SERVICE MANUAL

1225
SWITCHING AND
BALANCING UNIT

FAILURE TO RETURN THIS MANUAL
WILL RESULT IN A CHARGE OF AT LEAST

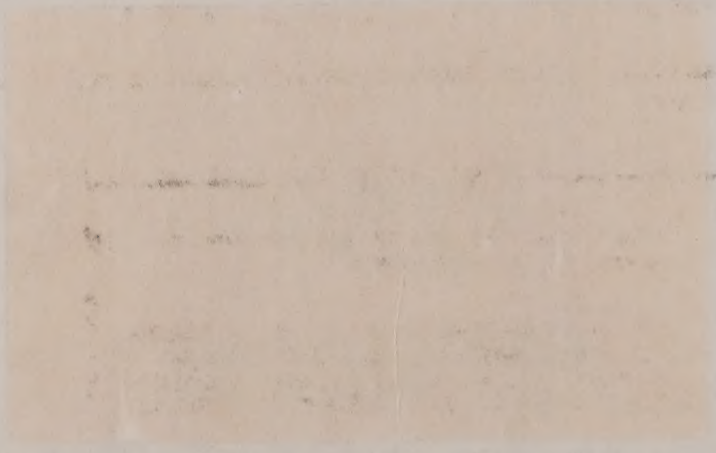
$25.00

Quick-rental® instruments

Printed in U.S.A.

BLH

February 1972



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BLH warrants the product(s) covered hereby to be free from defects in material and workmanship. BLH's liability under this guarantee shall be limited to repairing or furnishing parts to replace, f.o.b. point of manufacture, any parts which, within one (1) year from date of shipment of said product(s) from BLH's plant, fail because of defective workmanship or material performed or furnished by BLH. As a condition hereof, such defects must be brought to BLH's attention for verification when first discovered, and the material or parts alleged to be defective shall be returned to BLH if requested. BLH shall not be liable for transportation or installation charges, for expenses of Buyer for repairs or replacements or for damages from delay or loss of use or for other indirect or consequential damages of any kind. BLH may use improved designs of the parts to be replaced. This guarantee shall not apply to any material which shall have been repaired or altered outside of BLH's plant in any way so as, in BLH's judgment, to affect its strength, performance or reliability, or to any defect due in any part to misuse, negligence, accident or any cause other than normal and reasonable use, nor shall it apply beyond their normal span of life to any materials whose normal span of life is shorter than the applicable period stated herein. In consideration of the foregoing guarantees, all implied warranties are waived by Buyer. BLH does not guarantee quality of material or parts specified or furnished by Buyer, or by other parties designated by Buyer, if not manufactured by BLH. If any modifications or repairs are made to this equipment without prior factory approval, the above warranty can become null and void.

For any assistance contact your nearest BLH Electronics Sales and Service Office.

PATENT INFORMATION

BLH Equipment is manufactured under one or more of the following patents:

2,771,579	3,083,689	3,405,359	3,554,503
2,815,480	3,085,847	3,434,343	3,600,670
2,846,645	3,334,352	3,434,453	3,617,878
2,932,776	3,350,927	3,438,056	3,667,041

Patented in Canada 1955, 1958, 1960, 1966, 1967, 1968, 1970.

BLH ELECTRONICS, INC.
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SECTION I
GENERAL INFORMATION

1-1. GENERAL

1-2. The Model 1225 Switching and Balancing Unit, Figure 1-1, allows the outputs from a group of up to ten quarter-, half-, or full-bridge strain gage configurations to be successively monitored on a single Model 1200 Digital Strain Indicator. The outputs of more than ten strain gage arrangements can be accomodated by stacking additional Model 1225 units and connecting the outputs of the units in parallel to the 1200 indicator as shown later in this manual. Each channel can be balanced on zero or a desired reference point, over a range of ±7000 microinches per inch. Refer to Section II, Installation, and Section III, Operation, prior to wiring and operating this unit.

1-3. DESCRIPTION

1-4. The Model 1225 is enclosed in a vinyl-covered aluminum case similar to the Model 1200 indicator and is designed for bench mounting. The front panel of the unit mounts the individual ZERO BALANCE CONTROLS, a GAGE RESISTANCE switch, a CHANNEL selector switch, ten groups of input terminals and one group of output terminals. Figure 2-8. of this manual lists the controls and terminals and describes the function of each. Specifications for the unit are listed in Table 1-1.

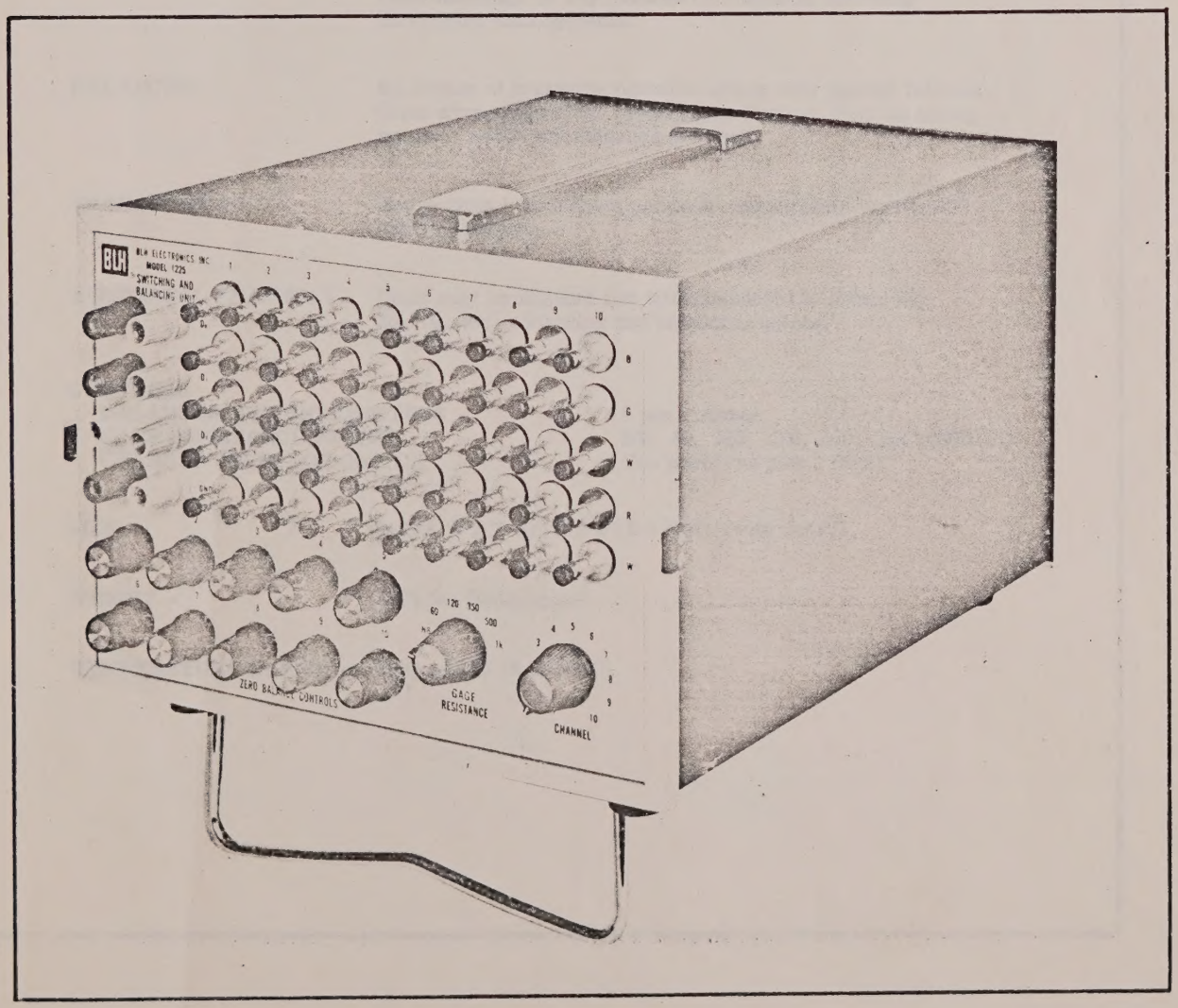


Figure 1-1. Model 1225 Switching and Balancing Unit

Table 1-1. Model 1225 Specifications.

INPUTS -	1/4, 1/2 and full bridge circuits or strain gage transducers.
GAGE RESISTANCES -	60, 120, 350, 500, and 1000 ohms on full bridge. 60 - 2000 ohms on half-bridge.
GAGE CONNECTIONS -	Ten, five terminal groups located on front panel. Gages may be connected to the instrument in active compensating pairs - groups of actives with a common compensating, or any desired combination including three wire lead systems.
BALANCING -	By means of balancing potentiometers with special friction drive zero adjustment requiring no locking. Full balancing range of ±7000 microinches per inch.
REPEATABILITY -	Better than 1 microinch per inch repeatability for 5×10^5 switch rotations.
ADDITIONAL CHANNELS -	Units may be stacked and interconnected to obtain 20, 30, 40, etc. switching and balancing points.
CONTROLS -	
BALANCING POTENTIOMETERS -	1 per channel
GAGE RESISTANCE SWITCH -	HB, 60, 120, 350, 500, and 1000Ω FB
CHANNEL SELECTOR SWITCH -	Ten positions plus "OFF"
SIZE -	9-7/8 W x 7-5/16 H x 13-1/4 D (with cover)
WEIGHT -	8.25 lbs (with cover)
TEMPERATURE RANGE -	40 to 130°F (5 to 54°C)

SECTION II
INSTALLATION

2-1. INTRODUCTION.

2-2. This section contains information on unpacking, inspection, installation and, if necessary, repacking for shipping or storage.

2-3. INITIAL INSPECTION.

2-4. Mechanical Inspection.

2-5. If external damage to the shipping carton is evident, ask the carrier's agent to be present when the instrument is unpacked. Check the unit for external damage such as broken controls or connectors, and dents or scratches on the panel surface. If damage is found, refer to paragraph 2-6 for recommended claim proceedure and repacking information. If the shipping carton is not damaged, check the cushioning material and note any signs of severe stress as an indication of rough handling in transit. Retain the packing material for possible future use.

2-6. CLAIMS AND REPACKAGING.

2-7. Claims for damage.

2-8. If physical damage is evident or if the instrument does not meet specifications when received, notify the carrier and the nearest BLH Sales/Service Office (see list in back of manual). The Sales/Service Office will arrange for repair or replacement of the unit without waiting for settlement of the claim against the carrier.

2-9. Repacking for Shipment or Storage.

2-10 If the instrument is to be shipped to a BLH Sales/Service Office, or to the factory, attach a tag showing owner with address, instrument model and serial number, and the repair required. The original shipping carton and packaging material may be reuseable. The BLH Sales/Service Office will also provide information and recommendations on materials to be used if the original packing material is not available or reuseable. Materials should include, (1) a double-walled carton (check with a freight carrier for test strength required), (2) heavy paper, or sheets of cardboard, to protect all instrument surfaces; use extra material around projecting parts of the instrument, (3) at least four inches of tightly packed, shock absorbing material surrounding the instrument. Close the package securely with heavy paper tape.

2-11. INSTALLATION.

2-12. Mounting.

2-13. The Model 1225 is designed primarily for bench top operation but will function normally in any position. The unit is equipped with non-skid neoprene pads and a tilt bail for use in the horizontal position.

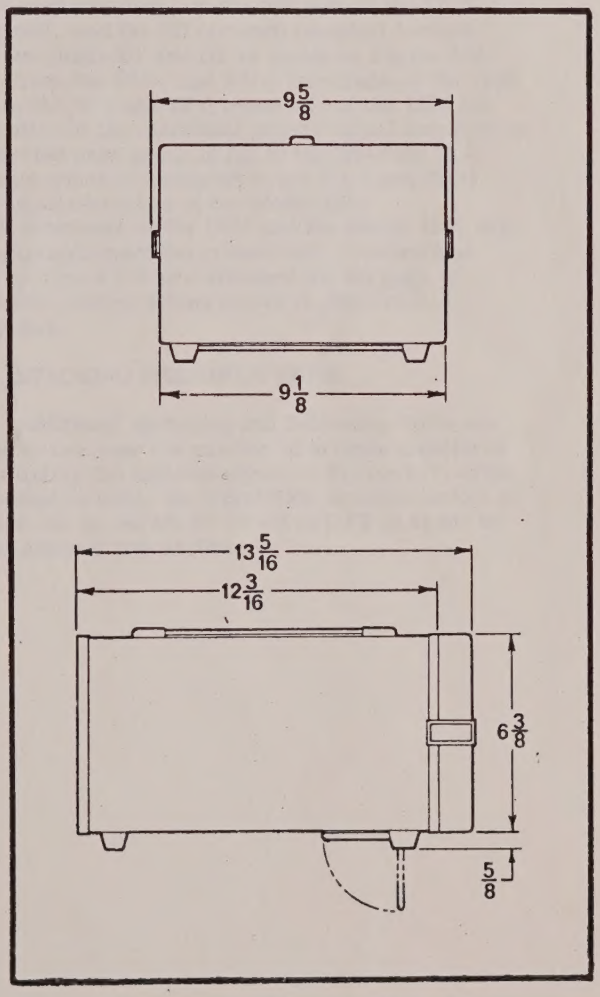


Figure 2-1. Mounting Dimensions

2-14. Environmental Considerations.

2-15. The switching and balancing unit will operate satisfactorily between 40 and 130°F (+5°C to 54°C) in most environments. In system applications, however, the narrowest temperature range of a given system component should be used as the determining factor. System location should be relatively free from dust, unusual temperature extremes, high humidity and vibration. The system should not be located in areas containing explosive or corrosive vapors or in the vicinity of strong magnetic fields; (e.g., large power transmission cables, welding equipment, high voltage transformers etc.).

2-16. STRAIN GAGE/TRANSDUCER CONNECTION DATA

2-17. Strain Gage Extension Leads.

2-18. The performance and accuracy of any strain gage network is largely dependent upon the care given to the selection and application of the material used as extension leads for interconnecting the gages and the switching unit. Before attempting to install any of the gage configurations illustrated in this manual, carefully read and follow the instructions and recommondations outlined in Section II of the Model 1200 indicator manual. Additional information concerning strain gage installation techniques and materials is included in the BLH Strain Gage Handbook available at no charge to the user.

2-19. Transducers.

2-20. Install transducers according to manufacturers' recommondations. If stranded wire is used, twist and tin the lead ends to prevent separation of strands when wires are inserted in the spring-loaded binding posts of the switching unit. Connect to Model 1225 as a four-arm configuration.

2-21. Gage Bridge Configuration.

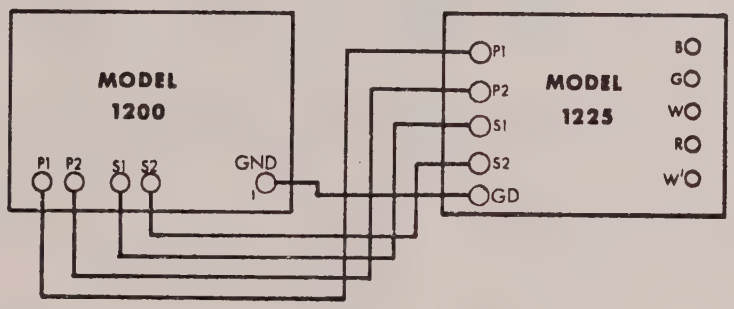
2-22. Four basic gage bridge configurations are illustrated in Figures 2-3 through 2-6: quarter-bridge, half-bridge (common compensating gage), half-bridge (individual compensating gage), and full bridge or transducer. Each bridge is shown connected to one or more of the ten input terminal groups at the front panel of the switching unit (in actual operation, any channel can be used).

2-23. INDICATOR/SWITCHING UNIT INTERFACE

2-24. The Model 1225 Switching and Balancing Unit is interfaced with the Model 1200 Indicator at the four color-coded terminals on the left side of the 1225 front panel, and the GD (ground) terminal located below terminals D1 and D2 as shown in Figure 2-2. Power from the P1(-) and P2(+) terminals of the 1200 is fed to the B(-) and G(+) terminal of the 1225 for distribution to the individual gages. Signal output from the selected gage group is fed to the W(+) and R(-) terminals which are coupled to the S1(-) and S2(+) signal input terminals of the Model 1200.
The GD terminals of the 1225 and the Model 1200 are used to interconnect the ground lead. Connections shown in Figure 2-2 are standard for all gage or transducer configurations shown in Figures 2-3 through 2-6.

2-25. STACKING MULTIPLE UNITS.

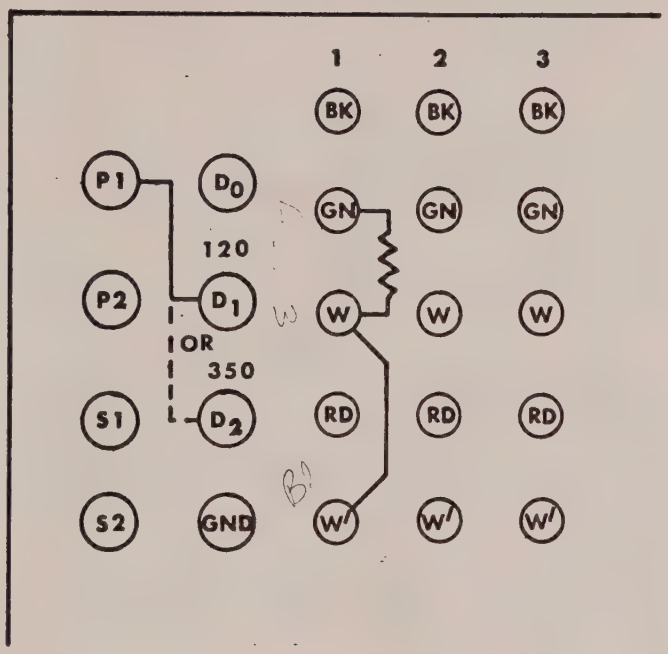
2-26. Additional Switching and Balancing Units can be used to increase the number of bridges monitored by paralleling the units as shown in Figure 2-7. When this method is used, the CHANNEL selector switch of each unit not in use MUST be set at OFF in order to prevent channel interaction.



Connect Model 1200 to Model 1225 as shown for operation with all gage bridge and transducer configurations.

When wired as shown, gages or transducers under compression loads will indicate negative (-) in the 1200 readout.

Figure 2-2. Indicator/Switching Unit Wiring Interconnection



1. Jumper terminal P1 to D1 for operation with 120Ω quarter bridges.

2. Jumper terminal P1 to D2 for operation with 350Ω quarter bridges.

3. Connect each quarter bridge gage between the green and white terminals.

4. Jumper the W terminals to the W1 terminals as shown.

5. Set 1225 GAGE RESISTANCE switch to the HB position. Set 1200 for 1/4 bridge operation.

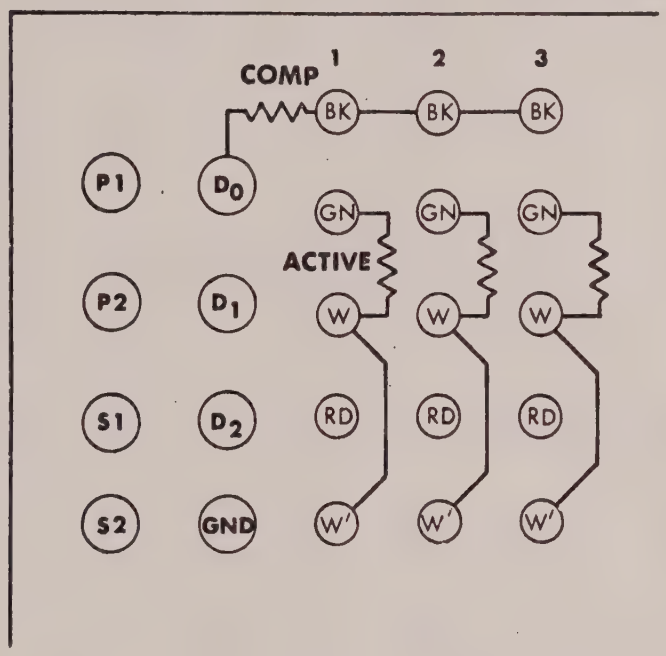
NOTE

This hookup is valid only for 120 or 350Ω quarter bridges. If gages with resistances other than 120 or 350Ω are used, use an external common compensating gage of the same resistance and make connections as shown in Figure 2-4, Three-Wire, Half-Bridge Wiring with Common Compensating Gage.

Figure 2-3. Quarter Bridge Wiring and Operation

NOTE

Active and compensating gage leads must be same size and length.



1. Connect active gages between the green and white terminals of each channel in use.

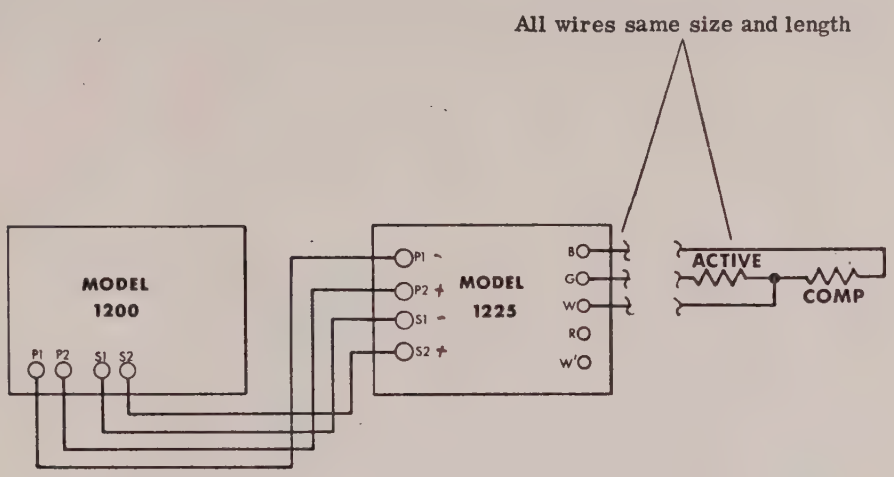
2. Connect the common compensating gage between the D_0 and black terminals.

3. Jumper black terminals together as shown for each channel used.

4. Jumper W to W^1 terminals in each channel used as shown.

5. Set 1225 GAGE RESISTANCE switch to the HB position. Set 1200 for 1/2 bridge operation.

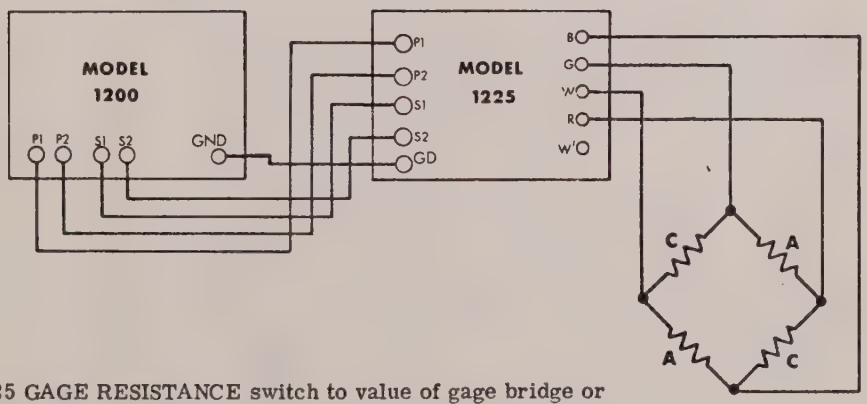
Figure 2-4. Three Wire, Half-Bridge Wiring with Common Compensating Gage



1. Connect active and compensating gages between the B, G and W terminals as shown. Extension leads must be the same size and length.

2. Set 1225 GAGE RESISTANCE switch to the HB position. Set 1200 for 1/2 bridge operation.

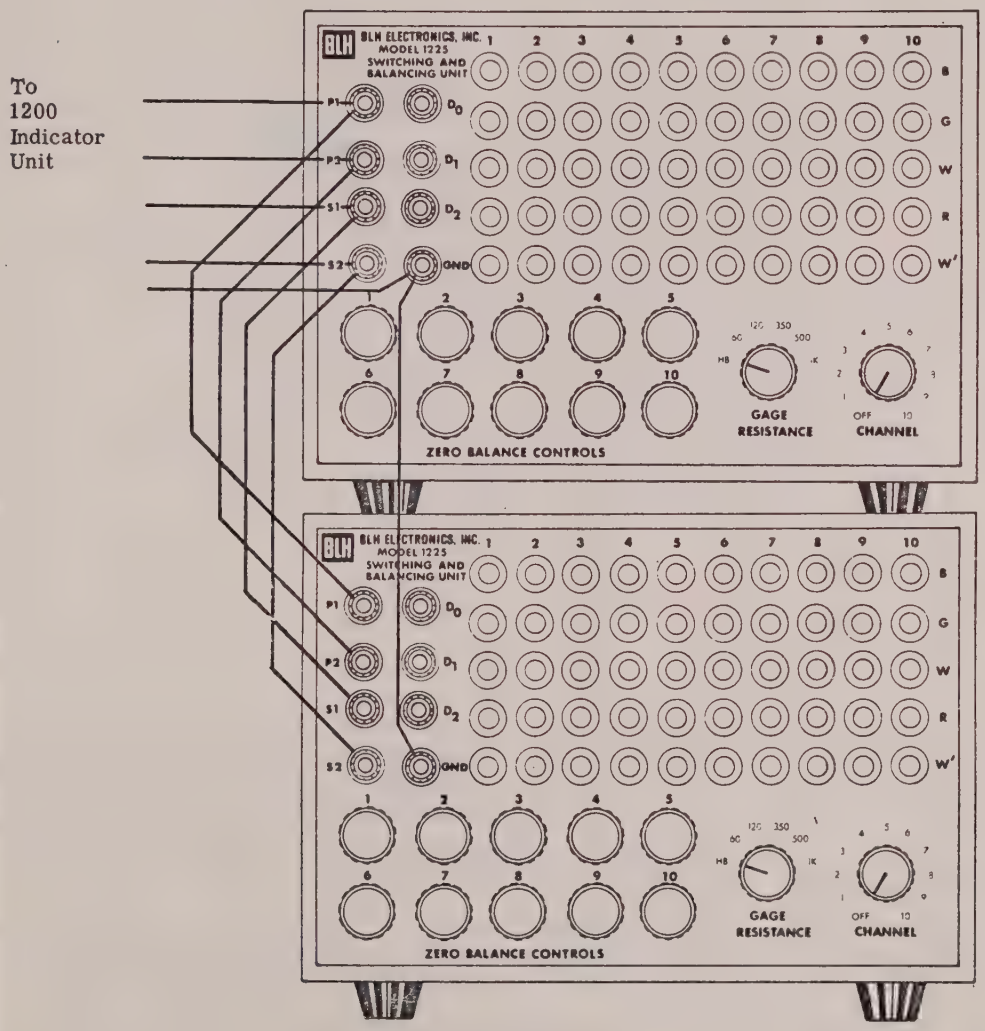
Figure 2-5. Three Wire, Half-Bridge Wiring (Individual Compensating Gage)



1. Set 1225 GAGE RESISTANCE switch to value of gage bridge or transducer. Set 1200 to FULL BRIDGE 120 or 350 ohm operation. NOTE: If gage bridge is other than 120 or 350 ohms, set 1200 to closest value i.e. if 60 ohm bridges are used, set 1200 to the 120 ohm position.

When gages are connected as shown, compression loads on the active (A) gages will indicate negative (-) in the digital display.

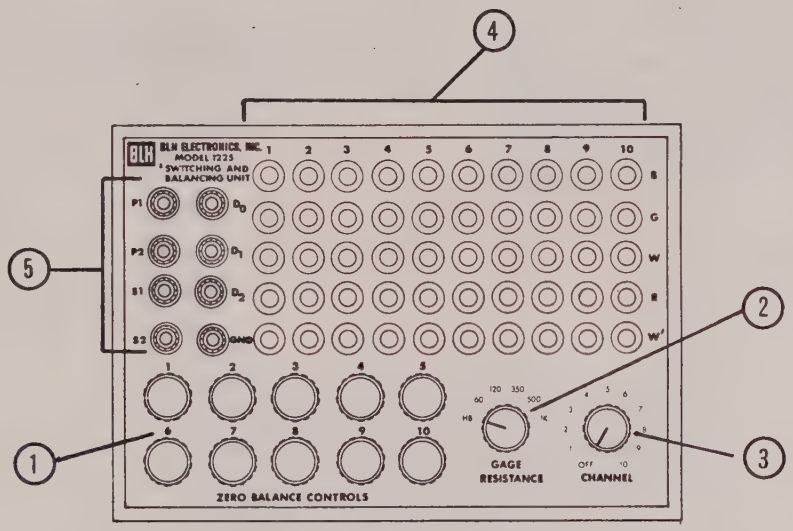
Figure 2-6. Four-Arm Bridge or Transducer Connections



Make gage connections exactly as shown in Figures 2-3 through 2-6. All units are parallel wired.

Figure 2-7. Stacking Multiple Switching and Balancing Units

FRONT PANEL



1. ZERO BALANCE: Potentiometer controls used for balancing output of gage configuration at zero strain. The shafts of these potentiometers are friction loaded to maintain the set position. Balancing range is ±7000 microinches per inch.

2. GAGE RESISTANCE: 6-position rotary switch used to maintain the full zero balancing range for half-bridge gage configurations or for full bridges with resistances of 60, 120, 350, 500, and 1000 ohms.

3. CHANNEL SELECTOR: Rotary switch used to select any one of the ten available channels. Position full counterclockwise for off.

4. Channel Terminals: Input terminals for gage bridge or transducer lead connections.

5. Output Terminals: Indicator connection points.

Figure 2-8. Control Location and Function Data

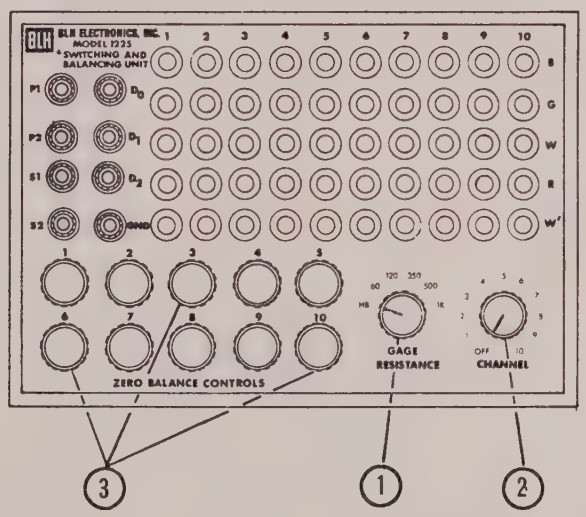
SECTION III
OPERATION

3-1. GENERAL

3-2. Method of operation will depend upon the gage configuration in use. Refer to the wiring arrangement illustrations in Section II of this Operating and Service manual for correct operating proceedures and control settings.

3-3. Switch Resistance.

3-4. Switch resistance tends to increase when the switch has not been moved for a long period of time. This is true even of the best switch materials - including silver. It is good practice to occasionally swing the switches back and forth over the full range of travel to eliminate any undesirable contact resistance that might have built up during the period of inactivity.



PRELIMINARY: Select half or full bridge configuration and connect gages to front panel input terminal posts as described in Section II of this manual. Connect OUTPUT terminals to strain indicator as specified in Section II of this manual.

1. Set GAGE RESISTANCE switch to HB for half-bridge operation or to value of strain gage bridge for full bridge and transducer applications.

2. Set CHANNEL SELECTOR switch to first channel in use. (If two or more Switching and Balancing Units are paralleled, set the CHANNEL SELECTOR switches of the unused units to OFF.).

3. Set zero or desired reference point with channel ZERO BALANCE control. Repeat for each channel in use, using respective channel ZERO BALANCE control.

4. Take strain measurement as described in the indicator manual for each channel.

Figure 3-1. Operation

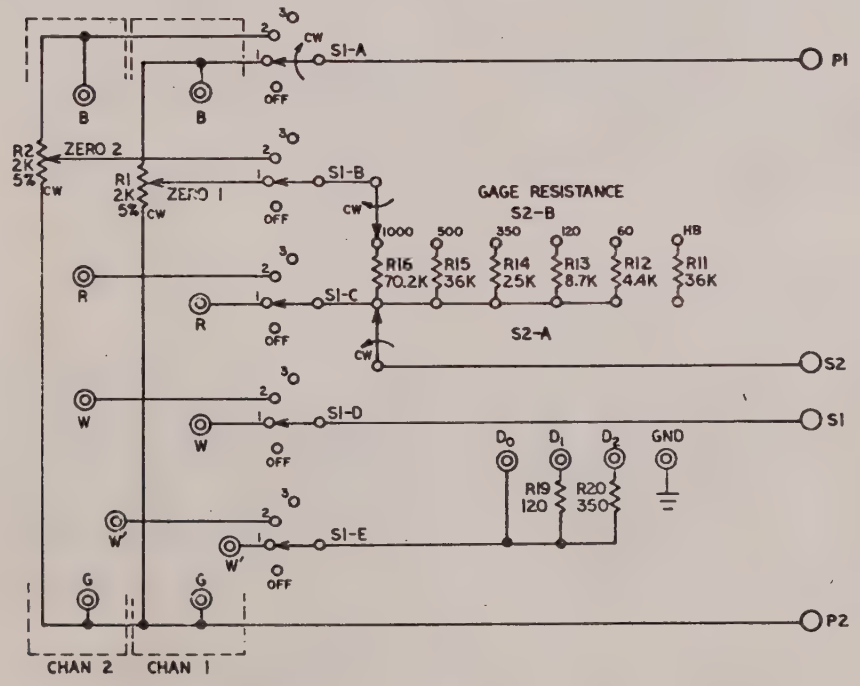
SECTION IV
PRINCIPLES OF OPERATION

4-1. GENERAL

4-2. The balancing potentiometer shafts are friction loaded and will remain where set. Each balancing potentiometer controls one channel. Each set of gages can be balanced or set to a reference level with this control over an approximate range of ±7000 microinches per inch. The balancing potentiometers are placed across the gage excitation voltage through the CHANNEL selector switch. The slider arm output passes through each switch position to the GAGE RESISTANCE switch. Refer to the schematic diagram, Figure 4-1.

4-3. The GAGE RESISTANCE switch maintains the full balancing range when using strain gages of 60, 120, 350, 500, or 1000 ohms for full bridge (four - arm) operation. For half bridge operation, the GAGE RESISTANCE switch must be set in the HB position.

4-4. The CHANNEL SELECTOR switch is an eleven position rotary switch (10 signal channels and OFF) wired to isolate the channel in use from other channel capacitance.



NOTE:

1. All resistance specifications in ohms.
2. Circuits duplicated for channels 3 - 10.
3. Circuit switches shown in channel 1 position only, other 9 channels are connected to switch positions in sequence.

Figure 4-1. Schematic Diagram

SECTION V
MAINTENANCE

5-1. GENERAL

5-2. No maintenance is required other than handling the unit as a precision instrument.

5-3. CALIBRATION

5-4. The ten point Switching and Balancing Unit requires no calibration. The Model 1200 Strain Indicator, however, should be calibrated with the Model 1225 in the calibration circuit, i.e.,

5-5. TROUBLESHOOTING

5-6. The circuit of the 1225 is designed for long, trouble free operation. Should trouble occur, it will likely be in one of the two switches, CHANNEL or GAGE RESISTANCE, or in one of the ZERO BALANCE potentiometers. Refer to the schematic diagram, Figure 4-1. All channels are identical.

5-7. To check the continuity of each ZERO BALANCE control, connect an ohmmeter across the G and B terminals of each channel. Resistance should read 2000Ω ±5%. The continuity of the ZERO BALANCE potentiometer slider arms can be checked by connecting the ohmmeter across the B and R terminals of each channel. The action of the potentiometer can be checked by rotating this control. Resistance readings will depend upon the position of the GAGE RESISTANCE switch. Series resistance values for each position of this switch are shown in the schematic diagram.

5-8. CLEANING

5-9. BLH series 1200 instruments are enclosed in a vinyl-coated aluminum cabinet and should be cleaned only with a damp cloth moistened in a solution of warm water and mild detergent. DO NOT use any chemical solvents or abrasive cleaners on the vinyl case or anodized aluminum surfaces. Use a soft brush to remove external dust accumulation. Loose dust within the chassis may be removed with dry, low pressure, compressed air or a small vacuum cleaner during the periodic maintenance check. Clean all mating connectors before reassembling the instrument with a good commercial contact cleaner.

5-10. PERIODIC CHECK

5-11. BLH recommends that the entire measuring system be performance tested on a quarterly basis or every 500 hours,if possible. The checks should be made by the quality control standards department. The instrument can be returned to BLH for a thorough overhaul whenever necessary and checked with test instruments traceable to the National Bureau of Standards. If user maintenance and calibration is not feasible, or if unusual problems or applications are encountered, a visit by a BLH Field Service Engineer can be arranged through the nearest BLH Sales/Service office or by calling the factory directly.

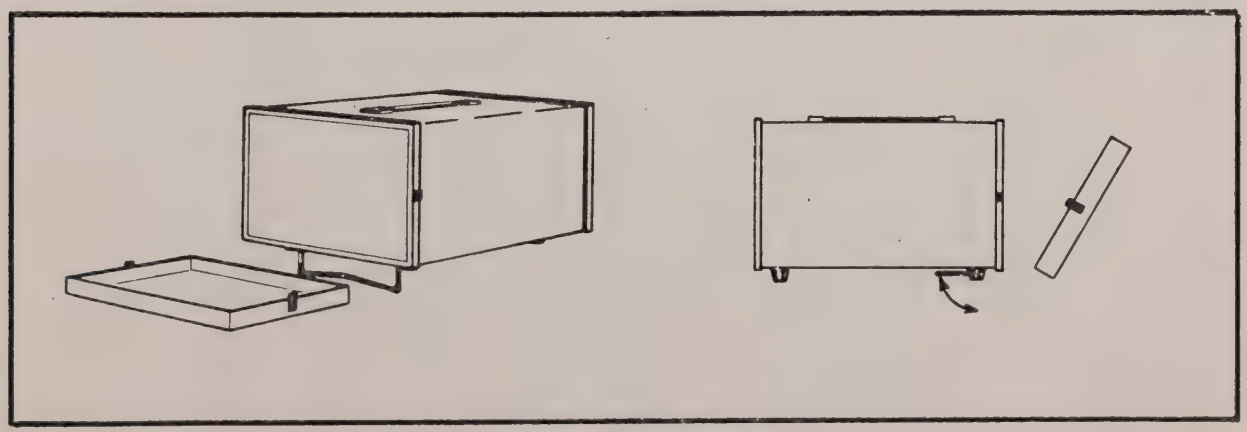


Figure 5-1. Cover Removal

SECTION VI
REPLACEABLE PARTS

6-1. INTRODUCTION.

6-2. This section contains information for identifying and ordering replacement parts. The figures list parts in alpha-numeric order by reference designator and provide the following information on each part:

a. BLH part number (where BLH is sole source).

b. Recommend spares for year application in a remote location (or 2000 hours). RS column.

c. Total quantity used in the instrument (TQ column). Quantity listed where item first appears on list.

d. Typical manufacturer of the part (where applicable) in a five-digit code taken from the Federal Supply Code for Manufacturers, Handbooks H4-1 (Name to Code) and H4-2 (Code to Name).

e. Manufacturer's part number.

6-3. ORDERING INFORMATION.

6-4. To obtain replacement parts, address order or inquiry for parts to the nearest BLH Sales/Service Office (see lists at rear of this manual) or direct to BLH. Identify parts by BLH part numbers.

6-5. To order parts not listed in this section provide the following:

a. Model number of the instrument.

b. Serial number of the unit.

c. Description of the part including function and location.

6-6. To order a part from the manufacturer other than BLH, provide the component part description and the manufacturer's code and part number from the table.

Table 6-1. Replaceable Parts

Ref Desig	BLH Part No.	RS	TQ	Description	Mfr	Mfr Part No.
END ITEM	416444-3			Main Assembly Model 1225 Sw. & Bal. Unit		
A1	416450-3		1	Assembly- Case		
A2	416445-3		1	Assembly- Front Panel		
A3	418680-2		1	Assembly- Cover		
MP1	417370-2		1	Frame		
A1	416450-3		1	Assembly- Case		
A1MP1	415594-3		1	Case		
MP2	413612-3		1	Frame		
MP3	416449-2		1	Rear Panel		
MP4	403508-1		1	Feet & Bail Kit		
MP5	416467-1		2	Angle		
A2	416445-3		1	Assembly- Front Panel		
A2J1	135149-8		1	Binding Post (Black)		
J2	135150-8		1	" " (Green)		
J3	135146-8		1	" " (White)		
J4	135145-8		1	" " (Red)		
J5	135148-8		1	" " (Yellow)		
J6	139459-8		3	Binding Post (Blue)		
J7				Same as J6		
J8 to J57	139443-8		50	Push Post		
A2MP1	416446-3		1	Panel		
MP2	203456-1		10	Shaft Lock (Used on R1 - R10)		
MP3	139444-8		10	Knob (Used on R1 - R10)		
MP4	138262-8		1	Knob (Used on S1)		
MP5	138261-8		1	Knob (Used on S2)		
A2R1 to R10	133646-8		10	R: Variable, 2KΩ		
A2S1	137241-8		1	Switch (Channel)		
S2	417203-1		1	Switch (Bridge Res.)		